Statistics:

High score = 96 Average = 65.5 Low score = 19

Standard Deviation = Irrelevant as it does not control grade distribution in this class.

Final exams will be mailed back, or can be collected at Dr H's office, only after the average is posted here.

A note about exam keys: The answers presented here are usually significantly longer than expected from a student taking the exam. An exam key serves not only to reveal what was expected, but to instruct you as well.

To see the final course grade cutoffs, consult the grading scale on the Chem 30A course web page.

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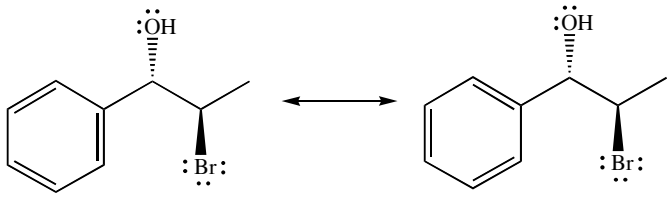
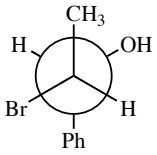
1. Alkyl bromide (or bromoalkane), alcohol, benzene ring.

2. (a) 110.0° (b) C-O-H

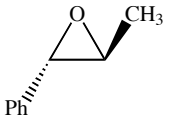
3. 

   These resonance contributors are of equal importance.

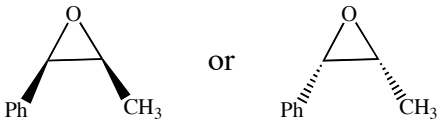
4. 

   Among given choices, only CH_3/H is gauche.

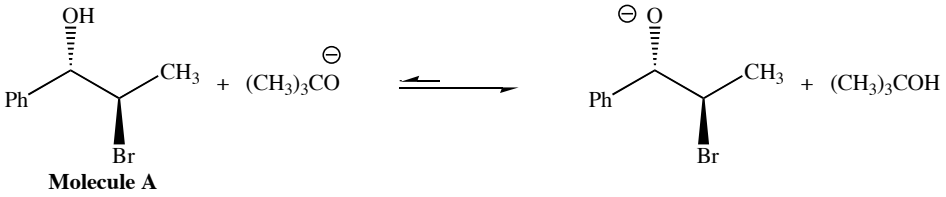
5. Lower. (Fluorine is smaller than bromine, hence less electron repulsion and lower torsional strain.)

6. 

7. Strain is equal.

8. 

9. Chiral; Optically active.

10. 

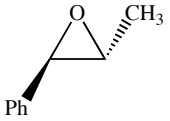
Molecule A

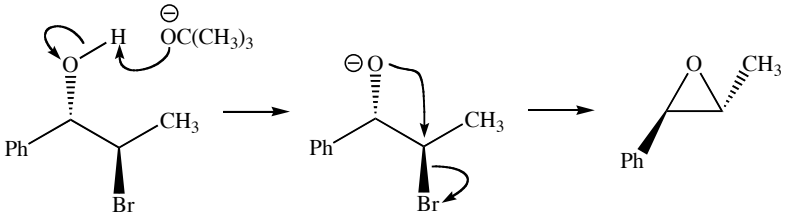
11. Resonance: Resonance has no influence in this case.

    Inductive effect: The bromine atom and the benzene ring pull electron density towards themselves away from the oxygen atom. This results in less electron density, making the corresponding alkoxide a weaker base and the alcohol a stronger acid.

12. $(CH_3)_3COH > (CH_3)_3CSH$ (ROH is a weaker acid than RSH.)

13. The stereochemistry of any S_N2 reaction is a result of **backside attack** or **attack on the carbon-leaving group σ* orbital**.

14. 

15. 

16. Rate = k [ROH]. *This is a unimolecular substitution, but not all unimolecular substitutions involve carbocations!*

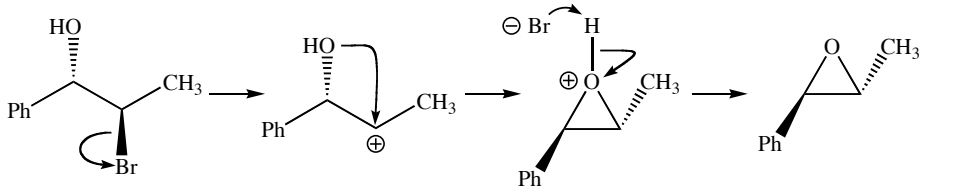
17. (a) Decreases. *CH_3OH is protic whereas DMF is aprotic. Protic solvents decrease nucleophilicity due to hydrogen bonding.*

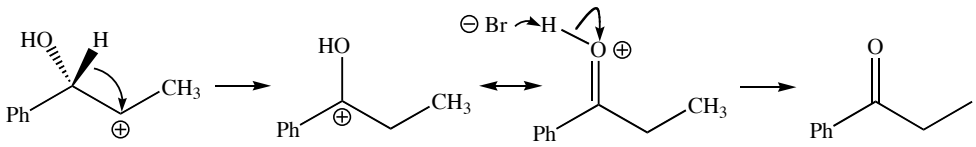
    (b) Decreases. *Chloride is a smaller atom than bromide, and thus is a poorer leaving group.*

    (c) Decreases. *The extra methyl group causes greater steric hindrance at the carbon bearing the leaving group.*

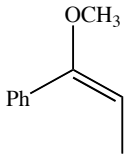
    (d) Decreases. *The CF_3 group causes steric hindrance at the nucleophile, and at the same time reduces nucleophilicity due to the inductive effect.*

18.



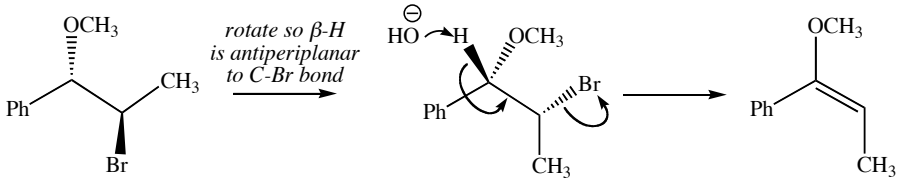


19.



20. E2.

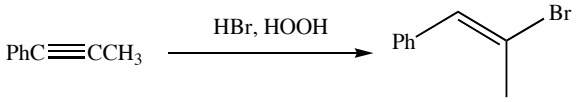
21.



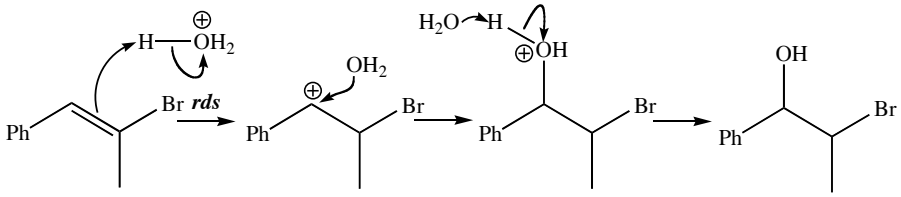
22. Molecule **F** is not formed in this reaction because alkoxides such as methoxide are not leaving groups in E2 reactions.

23. Decreased. *Actually, there is no elimination -- the reaction rate is zero -- because molecule **G** does not have any hydrogens that are beta to leaving group.*

24.

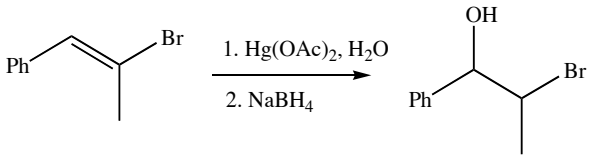


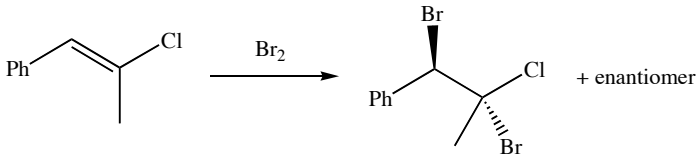
25.

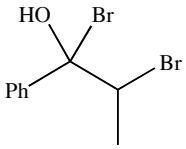


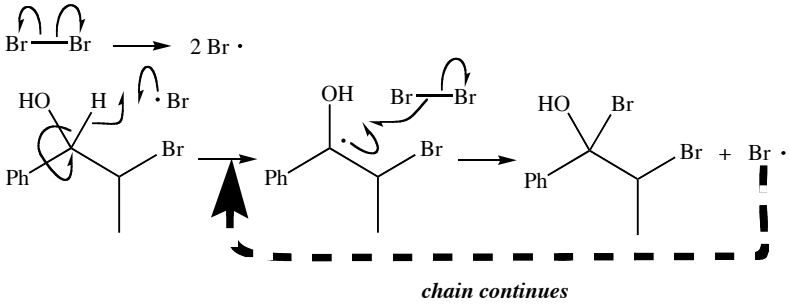
26. This reaction does not obey Markovnikov's Rule because the hydrogen of H_3O^+ becomes attached to the carbon that does not start with the most hydrogens.

27.



28. 
Ph
Cl
Br_2
Br
Ph
Cl
Br
+ enantiomer

29. (a) 
HO
Br
Ph
Br

(b) 
Br—Br
2 Br ·
HO
H
Br
Ph
Br
OH
Br—Br
Ph
Br
HO
Br
Ph
Br
+ Br ·
chain continues